CHAPTER 10

FORENSIC DENTISTRY

INTRODUCTION

Forensic dentistry may be defined as that branch of forensic medicine that applies dental knowledge to civil and criminal problems. The military simply expands this definition to include the unique needs of the military services. While it is true that our primary mission is to support requests for aid in forensic dental identification, you must understand that dental identification is only one of a number of major areas in forensic dentistry. These include: dental identification, bite mark analysis, human abuse and neglect, dental malpractice and negligence, and dental anthropology and archaeology.

As a basic dental assistant, your primary duties will be assisting dental officers and civilian dentists with the dental identification section in forensic dentistry when directed. The other major areas in forensic dentistry will not be covered in this book because they pertain mainly to dental officers and dentists.

PURPOSE

The primary reason we in the Navy have been directed to establish a forensic dental identification (ID) capability is to assure our ability to assist in the ID of human remains. In most cases this means identifying members of the Armed Forces, but occasionally it may include civilians. We are tasked to do this to meet both the civilian needs and the unique military needs for positive ID of individuals. The first four of these needs are common to both the military and civilian communities and include estate, insurance, legal, and psychological considerations. The last two needs are military considerations and include manpower and intelligence needs.

ESTATE

Positive ID is necessary to allow probate of the last will and testament and transfer of any inheritance to the deceased's next of kin. Without positive ID, this process could be delayed until the person is declared legally dead, or up to 7 years.

INSURANCE

Positive ID also is necessary to allow survivors to properly claim any life insurance held by the victim. Again, if a positive ID is not accomplished, the payment of insurance to the beneficiaries could be delayed for years. This would defeat the purpose for buying the policy in the first place and could deny any survivors the funds needed to adjust to the loss of the provider's income.

LEGAL

A less common but important consideration is the possibility of legal action such as malpractice or wrongful death litigation. Obviously, it would be very difficult, if not impossible, to prove wrongful death in a court of law if one cannot prove that an individual is dead. This would not only eliminate any possibility for compensation for loss of a loved one, but also could affect the legal handling of the deceased's estate as well as payment of any life insurance benefits.

PSYCHOLOGICAL

The last of the common needs is the psychological aspect of an individual's death. The loss of a loved one is frequently psychologically devastating to those left behind. In fact, many persons are not able to accept the death of their child, parent, or spouse until long after the occasion. Not knowing positively their loved one is dead complicates this process leading to false hopes and preventing the survivors from getting on with their lives. A graphic example of this was the tremendous agony experienced by the next of kin of our Vietnam missing in action.

MANPOWER

Simply stated, you need to know who the causalities are so you can rapidly replace them. If we do not know who the Sailors are, it will be impossible to replace them with persons of similar training and skills in their areas of expertise to restore full combat readiness.

INTELLIGENCE

You also must know the location and condition of our personnel familiar with sensitive operational information. If a Sailor who knows the details of an upcoming operation is missing, you need to know whether he is wounded, dead, or captured, and if the operation plans have been compromised.

OTHER METHODS OF IDENTIFICATION

Now that we have established the purpose for forensic dental identification and explained why we have been tasked to do so, we need to look at why dental techniques have become so important in forensic identification operations. To do this we need to look at some of the other different methods of forensic identification. Various methods of ID have been used depending on the individual situation.

Body Characteristics

Many body characteristics can be used to identify an individual. Recognition includes using visual, scars, deformities, and tattoos methodologies.

- **Visual recognition**—this is the most common method. It is reserved for instances in which no real doubt exists about the identity of the individual and death did not occur under unusual circumstances. Its drawbacks occur when changes in appearance because of illness, fire, water immersion, or decomposition make ID quite difficult. Figures 10-1 and 10-2 show soft tissue trauma from fire and water. Visual recognition, therefore, is considered an unreliable means of identification in medico-legal death investigation and not usually acceptable as positive proof on the identity of the deceased individual.

- **Scars**—this method is useful in some cases. Surgical scars are probably the most commonly found but are of the least value since they are seldom distinctive. Like visual recognition, scars can change or be destroyed by the same processes affecting visual recognition.

- **Deformities**—may be either soft tissue alterations or because of bony abnormalities. Radiographs of the deformity on file in the medical record can be useful in the ID process. The bony deformity must be significantly distinctive, however, to be of value as a means of ID.

- **Tattoos**—can assist in the identification process. Figure 10-3 shows a tattoo on an arm. Multiple tattoos would increase the likelihood of positive

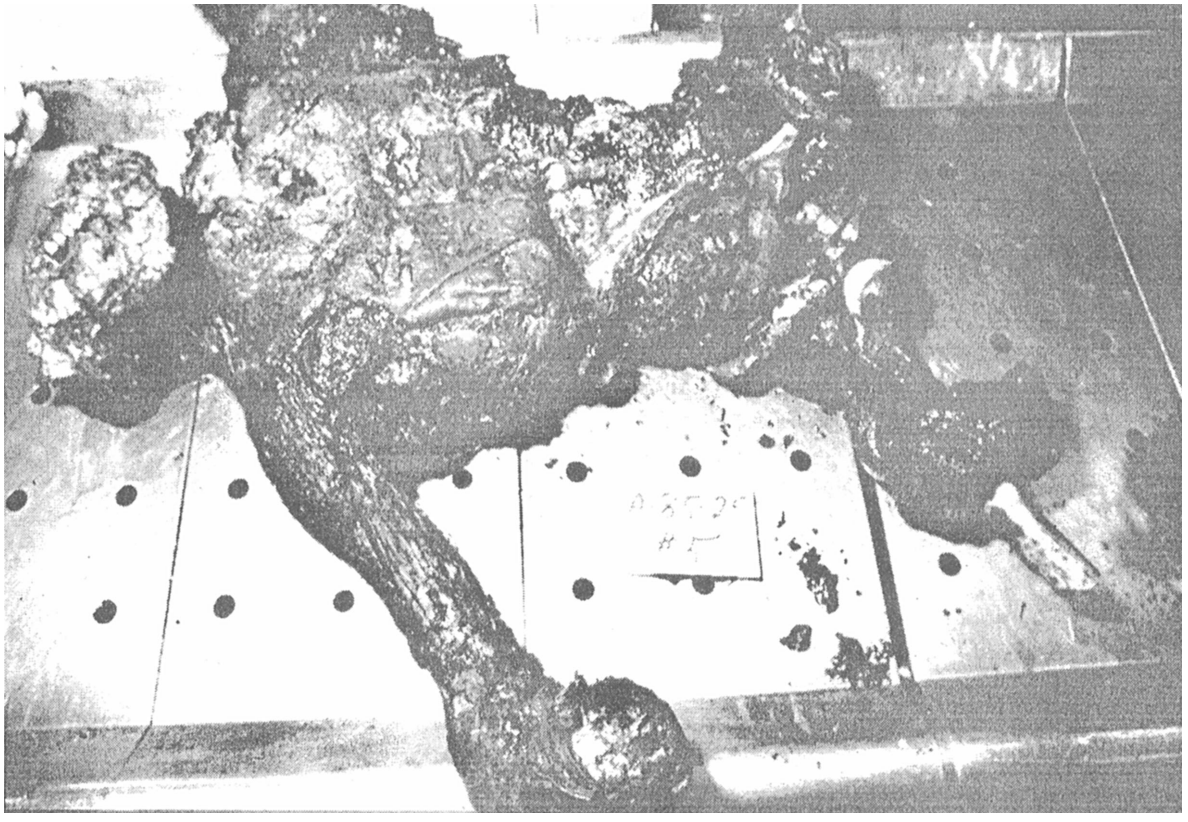

Figure 10-1.Charred remains from fire.

Figure 10-2.—Remains from immersion in water for two weeks.

identification. Again tattoos are soft tissue evidence and therefore are prone to easy destruction by environmental effect. For many reasons, tattoos should be used only as a secondary means to a positive ID.

Personal Effects

Personal effects may include anything that is found on the body of the deceased that can be used to assist in establishing the identity of the individual. Drivers' licenses, credit cards, ID cards, ID badges, and passports are just a few such items. In the military, dog tags are used specifically for this purpose. Other examples of personnel effects that may be helpful in establishing an identity include name tags sewn into clothing, distinctive jewelry, inscribed jewelry, and family photographs. Personal effects, however, are the

Figure 10-3.—Tattoo on an arm.

least reliable means of establishing an identity. They are not a physical part of the body, and, therefore, they may easily be transferred from one individual to another. In addition, lost or stolen items, and jewelry in particular, are very likely to be found in the possession of an individual other than its owner. Falsified documents may be found improperly identifying an individual as someone else. In most instances, the identity established by the personal effects will prove to be the actual identity of the deceased, but this must still be verified by a more objective, definitive means of ID.

Skeletal Remains

Identification by skeletal remains may be an excellent means to identify an unknown individual. In some cases, it can provide positive proof of identity that is acceptable in a court of law. Identification by skeletal remains requires matching of postmortem radiographs with radiographs that were taken before death. Features that can be used for ID by skeletal remains would include healed fracture sites, pathologic lesions, and medical hardware.

The main problem with ID by skeletal remains is the fact too few individuals in the general population have such characteristics. This makes it difficult to rely on as a routine method of ID of an unknown body.

Fingerprints

Of all the methods of ID, fingerprints are probably the **best known.** Fingerprints are an excellent means of positive ID. Figure 10-4 demonstrates a fingerprinting technique used by the FBI. Many individuals will argue that fingerprint ID is the most definitive means of identifying an unknown set of human remains, and it is generally accepted that no two individuals have the same set of fingerprints. Fingerprint ID, therefore, is always acceptable in a court of law.

DNA Analysis

DNA analysis, also known as DNA fingerprinting, is a fairly new technology that may replace dental identification and fingerprint identification as the most definitive means of identifying unknown remains. It will be fully implemented when an adequate database of DNA specimens can be established.

Figure 10-4.—Fingerprinting

DENTAL IDENTIFICATION

Dental ID, like fingerprint ID, is a definitive means of positive identification of unknown human remains. It also is routinely acceptable as evidence in court. It has several significant advantages, and only a few disadvantages when compared with fingerprint identification. The bulk of the remaining chapter will center on dental ID.

WHY DENTAL IDENTIFICATION WORKS

Dental evidence tends to survive much better than does soft tissue evidence such as facial characteristics or fingerprints. Teeth are calcified structures and are the hardest substance in the human body, even harder than bone. Because they are calcified, they are resistant to the environmental effects that destroy soft tissue evidence. Thus teeth are not destroyed by immersion in water, by desiccation (drying up), or by decomposition. Even in cases of skeletalization of remains, teeth are available for ID purposes. In addition, teeth are relatively resistant to destruction by fire. However, teeth can be destroyed in rare instances by heat if the temperatures are greater than 1000°F and the teeth are unprotected by the soft tissues of the cheeks and lips. Figure 10-5 shows intact dentition of a charred mandible. Teeth are further protected by the soft tissue mass of the tongue. The roots of the teeth are encased in the alveolar bone, providing an additional layer of protection. Therefore, even in fires where temperatures approach 1600°F, teeth are ordinarily found intact within the oral cavity and can be used for ID when all other means have been destroyed. In addition to the teeth, the materials used for dental restorations are also resistant to destruction by the environment, even more so than the natural teeth themselves. Gold alloys, as shown in figure 10-6, fused porcelain, synthetic porcelain, and porcelain denture teeth all will withstand temperatures exceeding 1600°F. Silver amalgam, the most commonly used restorative material, will resist temperatures up to 1600°F.

Large Number of Potential Points of Comparison

The human dentition is composed of 32 teeth, each of which may be restored, unrestored, or missing. When restored, any of the 5 different surfaces may be involved in the restoration. The number of potentially different dental chartings, considering even one restorative material, is astronomically large (1×10^{48}). In addition to restorations, the tooth crown form, root

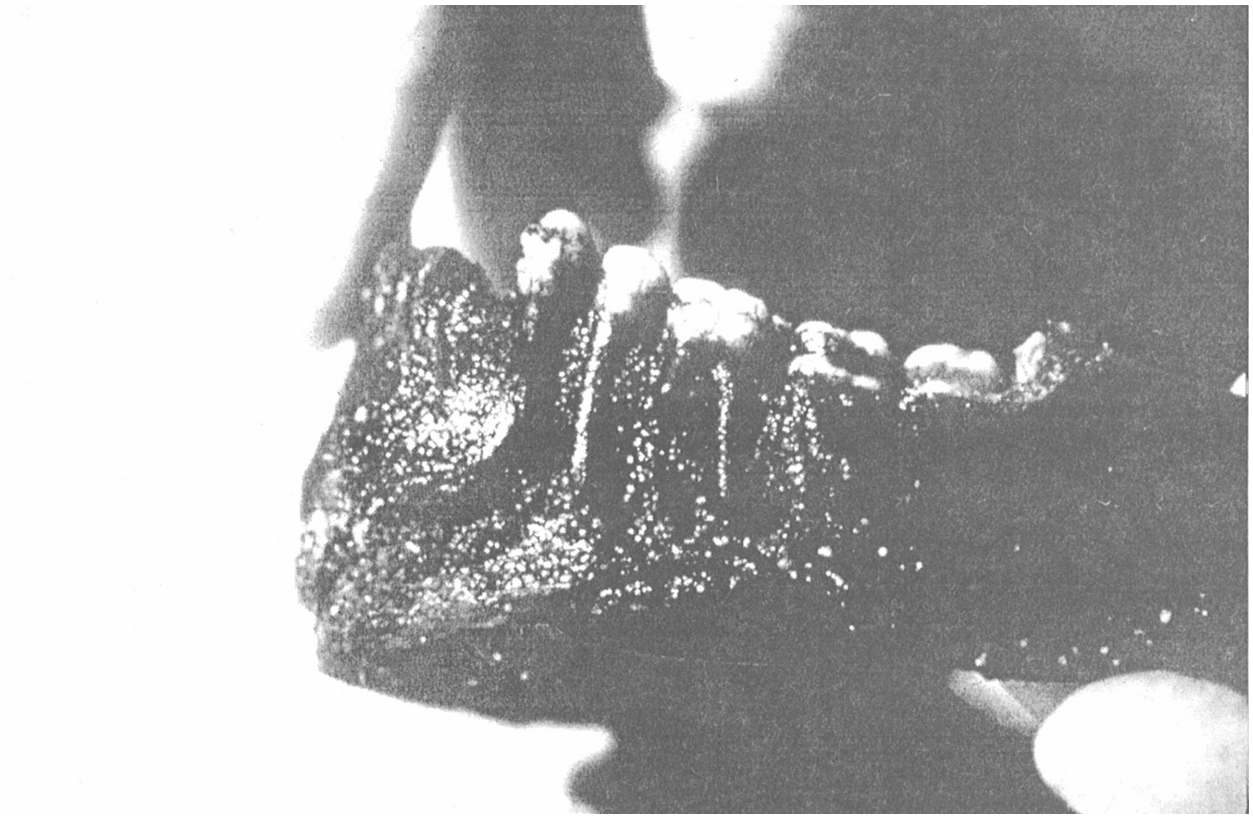

Figure 10-5.—Charred teeth.

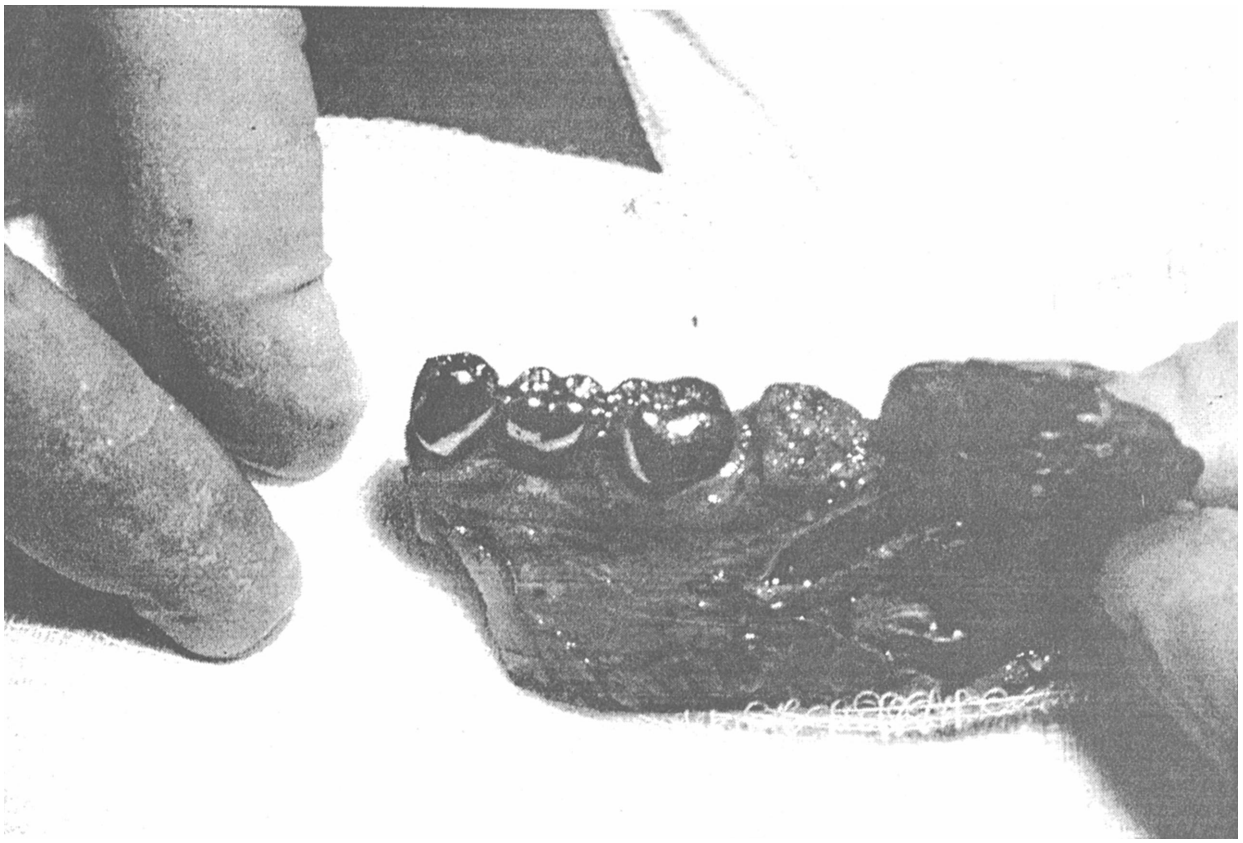

Figure 10-6.—Gold fixed partial denture from a fire.

canal, and root form provide numerous other potential points of comparison that make each set of teeth unique. Therefore, it can be said with complete confidence that, given sufficient data, no two sets of teeth are identical.

Antemortem Database

A decided advantage of dental ID over fingerprint ID is the relatively comprehensive nature of the antemortem database. An extremely high percentage of the general population has visited the dentist at some time in their life. Dentists routinely create dental records for these patients that detail the antemortem (before death) dental condition. These records are often maintained for long periods of time. Most importantly, dental radiographs are generated on almost every patient. Radiographs are hard evidence that is not subject to human error to the same extent that a written dental record might be. The radiographs also provide multiple additional potential points of comparison for establishing ID. With adequate dental records available to the forensic dentist, nearly 100% of unknown remains can be identified.

PROBLEMS IN DENTAL IDENTIFICATION

The dentist and you, the Dental Technician, may encounter many problems with dental ID. These problems can waste numerous hours or days before the final determination of ID.

Illegible Dental Records

Because in many cases the dental records are handwritten, the task of determining what treatment has been provided can be quite difficult.

Inadequate Dental Radiographs

Radiographs may not be found useful for comparison purposes for a variety of reasons. Most often this is because of poor quality of the radiograph obscuring the features necessary for comparison. It may also be because of a lack of positioning of the radiograph or absence of a date on the radiograph.

Lack of Adequate Charting

Many civilian dentists do not record the status of the dentition at the first appointment as required in the Navy. Pre-existing restorations, therefore, may not be documented in the dental record, leading to confusion in the final analysis.

Lack of Uniformity of Charting and Numbering Systems

Dentists might use multiple systems to record the treatment provided for a patient and to indicate which tooth was treated. Unless the forensic dental team is familiar with every possible charting and numbering system, a dental record may be unintelligible despite being legible. Luckily, most of the civilian and Navy dentists use a single system for charting and numbering teeth in the United States.

Changes in Dentition

Teeth are not fixed in the jaws. Small changes in position are constantly occurring in addition to the normal functional wear produced by chewing. These changes are not distinct over a short period of time, but over an extended time period these small changes can accumulate to produce significant differences.

Human Error

No matter how conscientious and persistent a dentist or Dental Technician might be about the accuracy of their dental records, errors in the written record will occur on occasion. This can cause discrepancies in the comparison and problems in establishing the ID.

PRINCIPLES OF DENTAL IDENTIFICATION

The principles of dental ID are identical to those used in any other ID method. The postmortem (after death) remains are examined and documented, then the antemortem records are obtained and reviewed, and finally the two are compared to establish similarities and discrepancies. In evaluating the comparison, the forensic dental team looks first at discrepancies. Discrepancies are more important than similarities since a single discrepancy can negate a whole list of similarities. It is important for the dental team to consider the source of the discrepancy. If the discrepancy is found in the written dental record, it may be possible to explain it on the basis of human error. However, if the discrepancy is in a radiographic comparison, it is extremely difficult to ignore. Discrepancies may be classified into two broad categories, relative and absolute.

Relative Discrepancies

These represent differences between the antemortem and the postmortem dental exam findings that can be explained by continued dental treatment. For example, an unrestored tooth may have been restored in the time interval between the last dental record entry and the death of the individual. Or, a small restoration may be enlarged because of additional decay. In any case, these discrepancies do not necessarily negate an identification if there are enough similarities in the remaining evidence.

Absolute Inconsistencies

These represent differences between the antemortem records and the postmortem exam findings that are physically impossible and prove the remains cannot be those of the individual under consideration. For example, an unrestored tooth is found in the unknown remains. On examination of the antemortem records, however, the radiographs reveal the tooth in question had previously been restored. Since natural tooth structure can never be replaced once it has been restored, this finding would verify that the remains were not of those of the suspect individual.

Once discrepancies have been examined, the dental team will compare the number and degree of any similarities found in comparing the antemortem and postmortem records. No minimum number of similarities are required or accepted for positive ID. In many cases a judgment decision on the part of the examiner may be required regarding the certification of the ID.

RADIOGRAPHIC COMPARISONS

At some point in the ID process, as shown in figure 10-7, the dental team will use dental radiographs and compare with the dental remains of the deceased. There are four categories in radiographic comparison.

Exact Match

The postmortem radiographs show a restoration that in every respect is identical to a restoration in the same tooth in the antemortem radiographs as shown in figure 10-8. In some cases, the radiographs may be laid on top of each other to compare. Multiple distinctive points of comparison are normally documentable in a single restoration.

Figure 10-7.—Forensic dental team comparing dental remains with radiographs.